Additional Comments on *Portland Harbor RI/FS Field Sampling Plan: Round 2 Sampling of Benthic Invertebrate Tissue* – 26 September 2005

In addition to comments submitted previously regarding the *Portland Harbor RI/FS Field Sampling Plan: Round 2 Sampling of Benthic Invertebrate Tissue*, these additional comments are submitted on behalf of the Confederated Tribes of the Grand Ronde Community of Oregon, the Confederated Tribes of Siletz Indians of Oregon, the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Warm Springs Reservation of Oregon, the Nez Perce Tribe and the Confederated Tribes and Bands of the Yakama Nation

The tribes have concerns about the locations and number of sampling localities proposed in the *Round 2 Sampling of Benthic Invertebrate Tissue* (hereafter referred to as the Field Sampling Plan, FSP), and about numerous issues regarding proposed field and laboratory efforts.

The stated objectives of the FSP are two-fold (1) measure constituents in benthic invertebrate prey organisms within the Study Area for use in (a) the ERA fish, bird and mammalian dietary exposure models, (b) evaluating risk to benthic invertebrate organisms using the tissue residue line-of-evidence in the ERA, and (c) calibrating the food web model, and (2) to calculate a site-specific biota-sediment accumulation factor based on both co-located tissue/sediment samples from the field and laboratory bioaccumulation tests.

In order to achieve these objectives, the EcoTeam should have discussed and agreed upon an experimental design that (1) explicitly identified criteria for choosing locations that would maximize the probability of achieving the stated objectives prior to the selection of sampling locations, (2) identified sampling locations based on these criteria, and (3) ensured a sample size adequate to address each of the stated objectives. However, none of these actions were taken.

The FSP states that the sampling approach will provide information on sediment exposure to benthic invertebrates and will address the following data needs:

- Characterization of benthic invertebrate body burdens throughout the Portland Harbor Study Area
- Characterization of benthic invertebrate body burdens near sandpiper feeding areas
- Characterization of benthic invertebrate body burdens in both quiescent and high flow areas
- Characterization of benthic invertebrate body burdens in areas with elevated chemical sediment concentrations
- Characterization of benthic invertebrate body burdens in areas of particular interest to EPA risk assessors

A total of 22 sampling locations are identified in the FSP (Figure 2-1), and appear to have been chosen based on 4 criteria: (1) occurrence in potential shorebird and/or clam

habitat, (2) to achieve adequate spatial coverage of the Initial Study Area (ISA), (3) sculpin were previously sampled from the location, and/or (4) the location has high levels of one or more contaminants of interest. Although these locations may be suitable for addressing the two objectives stated above, it is not clear that they will do so. Nor is clear that a maximum sample size of 22 is likely to satisfy the stated objectives. Both of these issues should be further discussed and agreed on by the EcoTeam. This may involve the movement and / or addition of locations.

It also is unclear how many composite samples of clams are likely to result from benthic sledge sampling. During the previous benthic reconnaissance survey (Windward and Integral 2005), 3 tows were conducted at each of 13 locations resulting in a mean mass of clam tissue of 2.25 g per tow. The FSP states that "multiple tows will be performed at each location and the clams will be composited with the previous samples until an estimated weight of 62 g has been achieved or until the lead field personnel decide that the desired weight cannot be achieved at that location." No explanation is given for why 62 grams is the target mass of tissue to be collected. Presumably this is adequate for analysis of all desired analytes, but this should be clarified. Assuming this mass is adequate, and based on the results of the reconnaissance survey, this implies that an average of 28 tows will be required at each location to obtain 62 g of clam tissue. Due to uncertainty in the relationship between clam size and clam wet tissue mass (Fig 3-3 in FSP), additional clams should be collected during additional tows to ensure that a minimum of 62 g of clam tissue is obtained at each location. It is likely, however, that some locations may have no or insufficient clams to obtain the mass of tissue required. In this case, it is imperative that either (1) additional sampling localities be identified *a priori* (preferable option), or (2) the EcoTeam agree on a contingency plan / process in the event that this occurs for (a) identifying additional locations to sample and/or (b) prioritizing the order in which analytes will be analyzed if insufficient mass of tissue exists to analyze all desired analytes. The current draft of the FSP lacks such a contingency plan.

We also are concerned about many aspects of the compositing process. One of the stated objectives of the FSP is to calculate a site-specific biota-sediment accumulation factor based on co-located tissue/sediment samples from the field. Preliminary analysis of co-located samples from Round 1 sampling (Windward 2005: Appendix C) indicates a statistically nonsignificant correlation in most cases between contaminant concentrations in co-located sediment and tissue. An examination of the procedures for collecting and compositing tissue and sediment samples indicates some factors that likely introduced significant error into the data thereby obscuring relationships that might exist. Results from the Round 1 Sampling Plan Report (Striplin et al. 2003: Figs. 5-2a-c, 5-3a-c) indicate that the locations of the (1) individual sculpin and crayfish, respectively, that comprised each composite sample were sometimes collected from localities many hundreds of meters from one another, and (2) individual sediment samples that comprised each composite sample were collected from 3-12 locations within each sampling locality that differ somewhat from the specific locations at which fish and crayfish were captured; further, the sediment samples were not collected contemporaneously with tissue samples. Tissue samples were collected mostly between June and September (June: 8%, July 11%, August 22%, September 20%) whereas sediment samples were collected between

October 16 and November 12. Thus, aside from other potential problems with sediment and tissue compositing (discussed below), it is clear that the tissue and sediment samples collected in Round 1 were not co-located as carefully as they could, and perhaps should, have been; therefore, we urge you to refine your experimental design to reduce these potential sources of error during the Round 2 benthic sampling. As a result, prior to initiating Round 2 sampling, we believe that it is important that the EcoTeam discuss and agree upon the (1) maximum distance between beginning and end points of tows within a single sampling location, (2) how sediment samples will be collected relative to the locations of each tow and estimated mass of clams obtained from each tow, and (3) how individual tow and sediment samples will be stored and composited. We recommend that (1) one sediment sample be taken at the midpoint of each tow from which one or more clams are obtained, (2) each tow and sediment sample from each tow be stored individually, i.e. that all tow and sediment samples within each of the 22 proposed sampling locations be stored individually for proper compositing in the lab (discussed below).

As mentioned above, we also are concerned about the specific procedures followed for compositing tissue samples; the following general guidelines, among others, should be used for collecting and compositing fish (as well as other fauna)(EPA 2000: Chapter 6):

1) the smallest individual fish within a composite sample should be no less than 75% of the length of the largest individual
2) Each composite sample should be composed of the same number of individuals
3) The composite sample should be composed of the same mass of tissue from each individual fish
4) The relative difference between average length of individuals within any composite sample from a given site (treatment group) and the average lengths of individuals in all composite samples from the site should not exceed 10% (US EPA 1990)
5) All replicate composite samples for a given sampling site should be collected within no more than one week of each other so that temporal changes in target analyte concentrations (e.g., associated with the reproductive cycle) are minimized

However, in reviewing the Round 1 Field Sampling Report (Windward and Integral 2005), it is clear that guidelines 1, 2, 4, and 5 were violated numerous times; insufficient data were provided to assess whether guideline 3 was violated, but we suspect that it was. Carefully following the guidelines above (as well as suggestions below regarding compositing of sediment samples) will reduce many sources of error, thereby increasing the quality of the data.

Regarding compositing sediment samples, the FSP states that "The maximum penetration of the power-grab sampler is 30 cm. A minimum penetration of 20 cm will constitute an acceptable grab." *Corbicula* are small clams (<5 cm width). Thus, it is unlikely that they are affected by sediments as deep as 20-30 cm. Therefore, we suggest that any sample

that penetrates 10 cm, and not more than 20 cm, constitute an "acceptable" grab. Also, it is important that the mass of sediment from each tow in which clams were obtained be proportional to the mass of clam tissue obtained from each tow. For example, if 62 g of clam tissue was obtained from two tows, 20 grams in tow no. 1 and 42 grams in tow no. 2, then sediment from tow no. 1 should constitute 32.2% (i.e. 20/62) of the composite sediment sample, and sediment from tow no. 2 should constitute 67.8% (i.e. 42/62) of the composite sediment sample.

We also are concerned about the feasibility of conducting the proposed sampling in the time frame preferred by LWG. It has come to our attention that LWG would like to complete the Round 2 benthic sampling prior to 17 October. Aside from all other concerns raised in the comments presented here and in our previous comments regarding the FSP, it is logistically extremely improbable that adequate clam tissue (62 g) could be obtained from many much less all of the proposed 22 sampling locations, even if sampling began immediately. The previous reconnaissance survey conducted a total of 39 tows at 13 localities over a 4 day period. If the Round 2 sampling requires about 28 tows at each sampling location, as argued above, this would require 38 days. Therefore, we hope that the proposed sampling will not be attempted prior to 17 October, and instead is conducted after the issues we have raised have been addressed and resolved to the satisfaction of the EcoTeam.

Last, the second stated objective of the FSP is to calculate a site-specific biota-sediment accumulation factor based on **both** co-located tissue/sediment samples from the field and laboratory bioaccumulation tests. However, as mentioned in our previous comments, we question the logic for and value of collecting sediment samples in order to conduct bioaccumulation tests with *Corbicula* in the lab. Because clams are filter filters, the contaminant levels in their tissues should largely reflect what is in the epibenthic water around them, not what is in the sediment. Thus, because the water used in laboratory bioaccumulation tests will have much lower levels of contaminants than the ambient water in the Lower Willamette River, it is virtually assured that analysis of data from bioaccumulation tests in the lab will result in a much lower BSAF than one based on data from co-located sediment/clam samples in the field. In other words, the lab data will not reflect total contaminant exposure to clams in the field. At best, the lab data might indicate the percentage of the total exposure that occurs through the sediment. The relevance and value of potentially being able to partition total exposure into its component parts (sediment vs. water column) is not clear. Therefore, before proceeding with the proposed lab bioaccumulation tests, it is important to explicitly explain how this knowledge will address the stated goals of the FSP and/or larger objectives of the RI/FS. Also, if *Corbicula* lab accumulation tests are conducted, and resulting BSAF values are much lower than those based on co-located sediment/clam samples from the field, as one would expect, how will these disparate results be reconciled?

Literature Cited

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